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ORIGINAL ARTICLES.

EPITOME UPON MALLEINE INOCULATIONS.

Translated by RICHARD MIDDLETON, D.V.S.

The discovery of Robert Koch—that a special extract from a pure culture of tubercle bacillus possessed a specific property when injected into the organism of consumptive animals—has been the incentive to other bacteriological investigators to apply analagous extracts to the eradication of other infectious diseases.

In veterinary medicine, the effete product and protein body of the glanders bacillus first came under consideration; the great similarity between the latter disease and tuberculosis readily leading to the opinion that in this affection such a specific action might be hoped for. The successful application of this conviction was reserved for Kalning¹, of the veterinary institute at Dorpat, Russia. He derived a lymph by consecutive cultures of the malleus bacillus, which induced noticeable symptoms in afflicted animals, but caused no alteration in healthy beings.

This virus, as it may be conveniently designated, was prepared by Kalning in the following manner: Take of the pure culture of glanders bacillus 5 g., add thereto 20 cubic centimeters of sterilized distilled water, placing the mixture in the thermostat regulated to 248° F. for twenty minutes. Within the

(1) Zur Diagnose des Rotzes. (Archiv. fur Veterinar wissen-schaften Bd. I., April-May, 1891, Petersburg).

course of forty-eight hours the same process was repeated four times; for the following forty-eight hours the clouded liquid remained in a temperature of 102° F. The same was now filtered by the aid of an air pump through a Pasteur filter, yielding at the termination 12 cubic centimeters of a transparent light yellow fluid, which was subjected fifteen minutes to a temperature of 248° F. Two glanderous patients and one artificially inoculated subject received 1 ccm. each of the liquid with the result that in from ten to thirteen hours the rectal temperature advanced 3.6° F. and 4.8° F. above normal; the same dose was administered to two healthy animals without inducing noteworthy increase in body heat.

Most unfortunately the pioneer in these experiments, Kalning, succumbed to an infection of the dreaded disease some weeks later, so that the researches were not perfected. Following Kalning came Preusse¹ and Pearson² who experimented in this direction, and who fabricated a lymph by an exclusive process.

Preusse obtained for the preparation of the malleine old, parched and hardened potato cultures of the bacillus, with the idea that these contained the material which stained the tuber a brown or a black—the active substance. These cultures were treated with a fluid composed of equal parts of water and glycerine, and allowed to remain several days in a thermostat at 95° F. He thereby secured by successive filtrations and sterilizations an oleaginous fluid, dark yellow in color and somewhat opaque; neutral or slightly acid in reaction, and of a peculiar odor, containing the pigment of the original cultures, which remained bleached. With this lymph Preusse proceeded with trials, using guinea-pigs afflicted with artificial glanders, also six suspicious horses which manifested no open character of the disease previous to the application.

For purposes of injection he diluted one part of the liquid with ten parts of a two per cent. carbolic solution, using of this to each horse from 1-3 ccm. (1-4.0 g. malleine. Seven and a half

(1) Versuche mit Rotzlymphe (Mallein). (Berl. Thier. Woch., 1891, No. 29).

(2) Ueber die Wirkling des Malleins. (Zeitschr. fur Vet., 1891, No. 5).

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hours subsequent to the first, a second inoculation was undertaken, with an increase in the dose to 3.0-5.0 ccm. (4.0-7.0 g. malleine). The operation of the same was highly interesting; five of the horses offered variations in the temperature, which fifteen hours after the first and eight hours after the second application had reached its zenith. The deviation occurred between 2.7° and 3.9° F.; the sixth horse, however, a two-weeks-old foal, manifested an increase, although exceedingly slight, amounting to 0.9° F., which after the last injection became normal.

In addition, each of the first five horses treated exhibited a doughy swelling about six inches in diameter which was painful upon pressure, involving the subcutaneous connective tissue. On the following day the subjects appeared apathetic and drowsy. The sixth, the foal, showed none of these characteristics. On the third day the post-mortem confirmed the suspicions regarding the five adult animals; in short, the malleine had reacted as a developer of otherwise latent dispositions of the glanderous disease.

Preusse next obtained a horse sound in every respect. To this animal he gave the malleine in large doses; in forty-eight hours no abnormal variation of the temperature was discernible, notwithstanding the fact that the same received 1.8 ccm. of the pure lymph. The autopsy confirmed the action of the virus. Opposed to the foregoing it is to be recorded that Preusse injected 0.5 g. of malleine in an intra-vitam glanderous patient, with the result that in nine to eleven hours the temperature advanced 2.7° F., which, upon repeating the dose, advanced $.72^{\circ}$ F. further. The "Preusse" lymph has been tried by numerous others, so that the record of the same is most complete. With this lymph Heyne-Posen¹ inoculated twenty-three head, Schillingoppeln² nine, Peters and Felisch³ ten and Dickerhoff⁴ and Lothes seventy. Of these one hundred and twelve horses the greater number gave no

(1) Versuche mit Rotzlymphes (Mallein) bei Pferden. (B. T. W., 1891).

(2) Experimenteller Beitrag zur Verwerthung des Malleins für Diagnose des Rotzkrankheit. (Ebenda, 1891).

(3) Beitrag zu den Impforosuchen mit Preussischer Rotzlymphe (Mallein) bei Pferden. (Berliner Thierarz Wochenschr., 1891).

(4) Beitrag zur Beurtheilung des Mallein. (Ebenda, 1891, 1893).

infallible sign that the dreaded affection had located within their organism.

In sixty-six of these cases, a reaction followed nine to ten hours after the injection, on an average, in doses of 0.5 g. mallein diluted with 4.5 g. of one per cent. carbolic solution; in the remaining forty-six no appreciable deviation from the normal. An autopsy upon the former revealed sixty three possessing the internal lesions of the affection; in two (Peters and Felisch, Dieckerhoff and Lothes) no pathological change could be noted, despite the most painstaking means. In one (D and L), a formation in the lungs which evidenced in its macroscopical character the glanders nodule, but which when applied to guinea-pigs gave negative results.

The post mortem upon the forty-six animals showing no symptoms, seconded the intra-vitam diagnosis.

In addition to the pyrexia, the afflicted subjects manifested great weakness, immobility of the sensorium, accelerated pulse and respiration with absence of appetite. Structural changes at the point of introduction were not uniform, the commonest lesion being an inflammation of an ephemeral nature which disappeared in the next few days.

Most interesting to note, is the fact that in all of those cases decidedly glanderous the circumscribing pulmonary and splenic tissue arranged itself in a zone of inflammatory quality, with the nodule as the central point.

Dieckerhoff and Lothes instituted further experiments with the object in view of determining the effect of the lymph when used upon horses afflicted with pleuro-pneumonia, rheno-adenitis, chronic inflammation of guttural pouches, sarcoma of same, etc. None of the animals in the trials were affected by the malleine; and no horse, free from malleus, exhibited fever reaction even when receiving three doses of the malleine.

Pearson obtained his malleine by adding salt and glycerine to a bouillon which had flowed over virulent potato cultures; subjecting the same, through fourteen days, to a heat of 97° F. in the thermostat, and again later, for several hours to 176° F. This thickened fluid, after being filtered through baked clay, be-

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came perfectly transparent; the same was sterilized by placing for twenty minutes, each day for three days, in a stream of flowing steam. When 0.25 to 2.0 ccm. of this fluid was subcutaneously injected into glanderous guinea-pigs, the body heat advanced in a decided degree, and redness, with swelling adjacent to the inoculation area were observed. In healthy animals the repeated injections produced only a local reaction and insignificant fever.

Since all fluid extracts of bacteria cultures are irregular in their consistency, and especially so regarding the active principle, Foth¹ and Gutzeit² have had in view the production of this active substance or essence in a more solidified and substantial form. Foth for this purpose procured three various kinds of malleine, which he distinguished as I, II and III.

Malleine I was prepared as Preusse describes, from potato cultures; malleine II from pepton-agar cultures containing glycerine; malleine III from the glycerine-buillon cultures. By adhering to Koch's method of procuring pure tuberculin, he proceeded with his effort to secure pure malleine. From malleine III there precipitated a yellowish flaky coagulum on the addition of absolute alcohol; by washing several times upon the filter with absolute spirits the same became grayish and unctuous. In the exsiccator, over chloride of lime or sulphuric acid, this product dries to a crumbling, white and spongy mass, which is easily pulverized and soluble in water, being about one-half per cent. of the original fluid. Similar results are secured by using malleine I and II, though the per centum is materially smaller.

This precipitate dried over sulphuric acid has been used by Foth upon field mice and guinea-pigs. Three field mice, which had been inoculated with glanders twenty-four hours previous, received of this powder 2-5 milligrams and succumbed twelve hours after; "control" mice inoculated at the same time and taking none of the powder, died four days after. An exquisite

(1) Untersuchung ueber die wirksamen Bestandtheile des Malleins. (Zeitsch. fur Veterinarblunde, 1892, No. 3).

(2) Ueber Mallein. (Ebenda 1892, No. 4 und 5)

subject of glanders, a guinea-pig, gave no response upon the administration of 0.01 gramme, but succumbed twenty-four hours after the injection of 0.03 grammes of the powder. Foith believes himself justified in assuming his product to contain at least *some* of the active principle.

Gutzeit has likewise succeeded in attaining similar results. He obtained his malleine from a bouillon culture—made from beef and horse meat with the addition of salt and peptone—maintained fourteen days at 98° F. and over. He now concentrated this gradually over the water bath, filtering it, and at last secured one-quarter of the original quantity; this was of a clear, wine-red color and neutral in reaction.

With this he inoculated ten horses, of which eight manifested an advance of 1.9°-5.2° F. in temperature, which lasted eight to ten hours; the other subjects remained normal.

The former exhibited glanderous lesions upon post mortem; the latter proved to be in a healthy condition. Gutzeit, in experiments upon the relative virulence of antiquated malleine, communicates that a preparation a few weeks old possessed activity, but in a lesser degree.

Finally, Gutzeit made investigations calculated to determine the chemical constitution of his product. By the addition of absolute alcohol, or an alcoholic solution of mercury chloride, he was again successful in securing the active agent in the form of a precipitate. He recovered the same material from the fluids of the glanderous cadaver (guinea-pigs and horses) but not from bouillon. Doses of 0.01 gramme and 0.15 grammes of this dried alcoholic precipitate induced 2.5° and 3.4° F. of pyrexia in all inoculated guinea-pigs and horses.

Gutzeit further eliminated from the alcoholic precipitate an effective body whose watery solution produced fever in glanderous guinea-pigs.

In the military veterinary colleges in Berlin, malleine prepared according to Gutzeit—alcoholic precipitate dissolved in water—was used by Engelen and Willach¹ in seven cases, of which six

(1) Malleinempfangen auf Grube Heintz-Dechen. (Zeitschrift für Veterinärmedizin 1892, No. 6).

responded by an increase of 3.0 to 4.6° F.; the single remaining animal gave no sign of fever. Post mortem confirmed the diagnosis as evidenced through the malleine.

The rectal temperature in these six cases continued long at its abnormal height, assuming very slowly and irregularly its physiological standard, without disturbing the general condition.

Exceedingly valuable are the instructions and tests of Nocard, which will here be exhaustively related. The investigator, in a correspondence to the *Récueil de Médecine Veterinaire*, in April, 1892, defines the application and operation of malleine as prepared by Roux at the Pasteur Institute. This product, under certain limitations, was able to discern glanders when all other diagnostic agencies failed. Nocard emphasizes the importance of always using the same malleine, *i.e.*, a product upon whose infallibility one has informed himself; such a material is to be procured in the following manner:

Through numerous passages it is possible to so augment the virulence of the glanders bacillus that rabbits which usually require months, and white mice which possess, practically, immunity, succumb within thirty hours from the intensity of its propagation and ravages. The bacillus is sown in peptonized glycerine-bouillon (the same as tubercle bacillus) and maintained for one month at 95° F.; after the expiration of this time the same is sterilized by subjecting to a torridity of 230° F. Now filter through paper, at a low temperature, in a vacuum in the presence of sulphuric acid, reduce its volume to one-tenth the original.

By this procedure the fabricator is in possession of a syrupy fluid of a peculiar odor and dark brown color, which maintains its freshness for a long period in the glare of the sun. For purposes of application, a mixture of 1.10 carbolic solution (5.1000 water) is used. This is uniform in its effects.

When subcutaneously injected in healthy horses, in doses of $\frac{1}{2}$ -1 cubic centimeter, it causes a local oedematous swelling, hot and painful in character, which never suppurates and which subsides in one to two days. Contemporaneously there appears a febrile reaction lasting twelve to fifteen hours, and amounting to an advance of 2.7° 3.6° F.; patient dull, inactive, trembling and without appetite.

When, however, less is injected, $\frac{1}{4}$ ccm, the effect in sound animals of the equine species is null; local reaction is about or hardly visible, body temperature normal and general health not influenced. On the contrary, the effect upon afflicted horses is noteworthy. Following the $\frac{1}{4}$ ccm dose is remarked a voluminous swelling at the point of injection, which is cedematous, painful and warm, seldom suppurating. Animal dejected, trembling and breathing more rapid than in health. Temperature soon reaches an increase of 4.0° F., arriving at its maximum at the tenth hour, after which it retreats somewhat, previous to remaining twenty-four to forty-eight hours at an advance above normal. Alterations in the pulse occur as the temperature varies.

Nocard handled forty-eight horses with malleine, of which thirty-four proved to be glanderous. In these the temperature advanced 3.0° - 5.0° F. Of the fourteen not affected only four manifested a deviation, insignificant in amount— 1.8° F.; these were suffering respectively from bronchitis, chronic swelling of the submaxillary gland of unknown nature, and melanosis.

He came to the conclusion, therefore, that all horses having no abnormality remained unaffected by malleine; while in horses giving a slight increase in body heat, the respiratory tract was invariably the seat of some lesion.

The following is instanced to illustrate how trifling the circumstance necessary to cause a variation: A horse which presented a slight enlargement of the submaxillary gland had been inoculated three times with the lymph, each time varying more than 1.0° F. from normal. After excision of the gland (cultures of the same having failed of operation) the animal was subjected to a fourth injection, upon which the temperature did not vary.

Another case, which had stood adjacent to a glanderous patient, was declared by Nocard to be itself affected, to the astonishment of other veterinarians. The autopsy and lymph corroborated his affirmation.

Finally, the malleine, so prepared, rendered cases of occult glanders patent, even when the nasal discharge and glands themselves were inoculated into other animals and failed of results.

Nocard recites other examples of the uniformity of this lymph, and suggests its application upon horses of the army.

He gives directions that when, following malleine injections, the temperature advances beyond 3.6° F., the animal may positively be asserted as glanderous; when, however, the thermometer registers an advance below 1.8° F., there is a possibility of an extraneous cause other than malleus. In all of those cases where the temperature deviates below these two grades, namely 1.8° and 3.6° , the evidence is not conclusive, but the observations should be proceeded with.

In a second communication (*Bulletin de la Societe Centrale de Medicine Veterinaire*, 28 April, 1892, *Recueil*, 30 Mai, 1892), Nocard relates another interesting case. The same exhibited induration of the lymph glands and circumscribed areas of hard swellings in the subcutaneous tissue, which were filled with suppurative contents. When the latter pus was inoculated into guinea-pigs and spread upon various soils, the result was negative in so far as propagation of the glanders bacillus was at stake. Nasal discharge absent, and only in the interior of the nose small adhesions of dried mucous were visible.

Subsequent to the malleine administration the temperature increased from 101° F. to 106° F., and the course was a typical one; an immense œdematous, hot and painful swelling was remarked at the point of injection, accompanied by a chill. By repeating the inoculation of the pus from the skin swellings, the result was again void.

A second application of the lymph placed beyond all reasonable shadow of doubt the fact that the horses were glanderous. Nocard, in order to nullify the negative evidence of the guinea-pigs, etc., made a subcutaneous injection of 0.25 pilocarpine, and ordered the subject to be exercised with the idea of increasing the nasal discharge. The serous excretions from the nose he used upon guinea-pigs, and obtained notoriously positive results.

The question here involved had to do with the nature of the pus contained in the cutaneous enlargements. Transplanting of the same upon horses, cattle, goats, etc., showed it to be neither horse-pox, glanders, nor adenitis. As a direct sequence then, from the promises offered, it is to be affirmed that a glanderous horse can fabricate a healthy pus, and that glanders is a progress-

ive disease which depends upon the state in which the virus is incorporated in the blood.

The favorable issue of these experiments, and the importance of the subject, induced the Bureau of Contagious Diseases connected with the Royal College at Munich to formulate similar trials. Assistant Hoflich prepared a lymph as instructed by the foregoing investigators.

A peptonized bouillon made from horse meat, and to which glycerine had been added, was fructified with the glanders bacillus from potato cultures of the first generation. The same was placed in a breeding-oven thermostat, and maintained at 98.6° F. for approximately three weeks. The preparation, which had become opaque, thick and yellowish gray in color from the propagation of the bacillus, was now tested relative to its containing the microbe. Sterilization was accomplished by placing in escaping steam. After percolating through ordinary filter paper and adding a 0.5 per cent. carbolic solution, Hoflich obtained perfectly clear reddish brown liquid of singular odor.

Six guinea-pigs, of which four had been artificially inoculated three weeks previous, were given injections of $\frac{1}{2}$ ccm., to which the same quantity of a 1 per cent. carbolic solution had been added. After five hours the four affected animals, which exhibited tumefaction of the inguinal glands, experienced a rise in temperature which reached its zenith five hours later.

The table explains in detail the variations of temperature:

INOCULATION ON JUNE 23, 1892, 8 O'CLOCK A. M., 0.5g.

MALLEINE.

	8 A.M.	9 A.M.	10 A.M.	11 A.M.	12 A.M.	1 P.M.	2 P.M.	3 P.M.	4 P.M.	5 P.M.	6 P.M.	7 P.M.	8 P.M.	REMARKS.
Guinea-pig I	37.2c.	37.5	37.0	38.5	38.8	39.1	39.0	39.5	39.7	40.0	40.2	39.6	39.0	Glanders.
" II	38.4c.	38.0	38.5	38.8	39.0	39.3	39.4	39.3	29.6	39.5	39.6	39.1	38.9	"
" III	38.0c.	37.8	38.2	38.3	38.6	38.9	39.3	39.2	39.5	40.0	39.6	39.2	38.8	"
" IV	37.7c.	37.5	36.9	38.0	38.5	39.1	39.3	40.3	40.4	39.8	39.7	39.5	39.1	"
" V	38.1c.	38.3	38.4	38.0	38.2	38.0	37.5	37.9	38.1	38.2	38.4	38.1	38.5	Free from Glanders.
" VI	37.5c.	37.4	37.8	37.6	37.5	37.5	37.4	37.5	37.3	37.5	37.7	37.8	37.8	"

Through the kindness of the district veterinarian at Munich, Höflich had opportunity to try the effectiveness of the lymph upon five horses, three of which were suspected as suffering from being in contact with the other two which were probably gland-erous. Each of these patients received 1ccm. of malleine, diluted with 4ccm. of a 1 per cent. acidum carbolicum solution, under the skin upon the left cervical region. Twelve hours later each received subcutaneously 2ccm. upon the right side of the neck.

Tabulated observations upon these animals is given below:

FIRST INJECTION JULY 4, 1892, 8 O'CLOCK P. M., 1 GRAMME MALLEINE.

SECOND INJECTION JULY 5, 1892, 8 O'CLOCK A. M., 2 GRAMMES MALLEINE.

		July 4th.						July 5th.					
I.	Pulse.	38	40	44	44	40	46	40	38	40	42	42	44
Five year old	Resp.	16	16	18	16	14	15	16	14	20	14	14	16
black mare.	Temp.	38.4	38.3	38.2	38.3	38.5	38.4	38.5	38.7	38.6	38.5	38.6	38.8
II.	Pulse.	40	44	40	42	46	50	48	52	50	50	48	48
Ten year old	Resp.	16	16	18	20	18	22	20	24	20	22	18	20
chestnut geld.	Temp.	38.2	38.0	38.1	38.2	38.8	39.2	39.2	39.1	39.4	39.2	39.0	38.9
III.	Pulse.	40	40	40	42	40	40	44	42	42	40	44	44
Six year old	Resp.	14	12	12	12	16	16	16	14	14	12	14	16
all brown gld.	Temp.	37.8	38.5	38.4	38.5	38.2	38.4	38.2	38.1	38.1	38.2	38.7	38.6
IV.	Pulse.	48	48	48	46	48	48	44	46	46	48	46	48
Fourteen	Resp.	20	16	20	18	18	16	18	18	18	16	20	22
year old bay.	Temp.	38.4	38.4	38.3	38.5	38.7	38.3	38.6	38.7	38.6	38.8	38.8	38.7
V.	Pulse.	44	44	42	40	44	44	44	42	40	42	44	44
Six year old	Resp.	16	18	16	16	12	12	14	14	16	18	16	18
brown.	Temp.	38.3	38.1	38.5	38.5	38.4	38.3	38.3	38.2	38.3	38.4	38.6	38.4

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On the 13th of July the two probably glanderous animals, Nos. I and II of the table, were given the third injection upon the left shoulder; this was composed of 2ccm. of malleine and 3ccm. of a 1 per cent. carbolic water.

The table below traces its effect:

THIRD INJECTION JULY 13, 1892, 6 O'CLOCK A. M., 2 GRAMMES
MALLEINE.

		6 A.M.	8 A.M.	10 A.M.	12 M.	2 P.M.	4 P.M.	6 P.M.	8 P.M.
I.	Pulse.	40	40	40	38	40	42	42	44
Five year old	Res.	14	14	12	16	16	14	12	12
black mare.	Temp.	38.0	38.1	38.2	37.9	38.0	38.3	38.3	38.2
II.	Pulse.	36	36	40	33	44	52	56	56
Ten year old	Resp.	16	16	18	20	24	24	22	26
chestnut geld.	Temp.	37.5	37.8	38.1	38.6	39.1	39.4	39.5	39.3

The general health of all of the horses, with the exception of No. II, was not essentially disturbed; only this animal manifested important advance of temperature, respiration and pulse, together with great immobility and anorexia.

The local lesion consisted of an cedematous, hot and painful enlargement at the point of introduction; in the others this was of less importance.

According to the tabulated results it appears that only No. II was suffering from glanders. The autopsy of all the horses was held on the 14th July (excepting No. IV, which was killed on July 9). In I, III, IV and V no lesion of a glanderous nature could be detected despite the most trying investigation. On the other hand, No. II displayed the most conclusive evidence in great abundance—in the right lung a superficial, lobular, pneu-monic herd, which upon section showed several small, yellowish tubercles with softening of the center.

Summing the various series of experiments which have been

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made up to the present time, it may be affirmed that malleine inoculations accomplished the purpose for which they were devised. The practitioner is not in a position to prepare his own lymph, generally speaking, but could, through the experiment stations or public laboratory, secure the lymph.—*Monatschrift f. Thierheilkunde*.

THE DISINFECTING PROPERTIES OF CARBOLIC ACID.*

BY DR. J. A. REPLOGLE.

INTRODUCTION.

Disinfectants are at present, and have been ever since the introduction of the germ theory, of vast importance to both the physician and surgeon. So common is their use that no modern surgeon will attempt to dress a wound, or perform an operation without the use of disinfectants. No wound of ulcerating or suppurating condition, or any trouble that may be accompanied with or caused by micro-organisms, is treated without the use of disinfectants.

The physician, as well as the surgeon, finds it necessary to use disinfectants in treating or preventing all specific or contagious diseases.

Without the use of disinfectants nothing would prevent an epidemic, when once started, from passing over an entire continent, and perhaps the entire world, unless the micro-organisms would simply lose their virulence from age and other surrounding conditions. In fact, this class of drugs is altogether indispensable, and more especially so in surgical work where it is absolutely necessary to destroy any organisms that may drop into the wound during operation. But it is a question as to what drug will destroy organisms best with the least possible inconvenience from its use. Hence, I have en-

*Paper read before the Iowa State Veterinary Medical Society. This paper represents work done in connection with a graduating thesis made under the direction of Dr. W. B. Niles at the Veterinary Department of the Iowa Agricultural College.

deavored to make an investigation of the disinfectant properties of carbolic acid, more especially with reference to disinfecting instruments and wounds.

HISTORY.

Carbolic acid was discovered in 1834 by Runge, who gave it its first description and named it carbolic acid. Its constituents were first investigated by Laurent, who gave it the name phenol hydrate.

Embalming dead bodies is the earliest illustration of the systematic use of disinfectants; for this purpose carbolic acid was used as early as 1843, by the Egyptians.

In 1847 Runge said: "Carbolic acid would stop decomposition in putrid meat, and if the meat was then dried, would not decompose again," and recommended it for embalming dead bodies.

Prof. Leister, of Edinburgh, was the first to use carbolic acid as a medical agent. In 1860 he said it would stop fermentation depending on an organic ferment. But it was not known at that time how it brought about this change. From 1860 to 1870 but little mention is made of its being used as a medical agent. From 1870 to 1874 it was used by Prof. Leister in dressing wounds and suppurating sores. He then called it an antiseptic because he believed it destroyed the germs that Klebs, at that time, claimed suppuration to be due to. At this time many other doctors began the use of carbolic acid in surgical work, dressing wounds, suppurating sores and in many forms of skin disease. After 1878 its use increased more rapidly until the present time. Its use has become so extensive and the demand so great that the United States consumes 70,000 lbs. annually, more than they can produce.

Thus it is seen that carbolic acid did not come into use as a disinfectant by some sudden discovery through an investigation of its therapeutical properties, but came into use slowly and gradually; first, by noticing its preserving properties, then the so-called healing effect it had on wounds, and along with the development of the germ theory it was found that it would destroy bacteria.

So common is its use at present that no druggist, physician or surgeon is without it. A very large number of the disinfecting preparations are partly composed of carbolic acid. Yet its disinfectant properties are questioned by some of the best modern medical men, some declaring it is not even an antiseptic.

In my experiments with carbolic acid I have endeavored to demonstrate the proper amount of acid present in solution necessary to destroy germs, as well as to demonstrate the fact of its being a disinfectant.

While the conditions in the laboratory are not the same as in disinfecting wounds, it is the only way by which we are able to arrive at a satisfactory conclusion, for in disinfecting wounds we do not know the number of germs present, nor can we estimate the number of germs that survive the action of the acid. But in the method I have employed we are able to approximately estimate the number of germs exposed to the acid, also the number of germs that survive after exposure to the acid, at different lengths of time, which will be seen by the experiments.

There are two general methods of testing a disinfectant.

First: By using cultures dried on silk thread, etc. This is the method Koch used in his early work in testing disinfectants, but as it did not give satisfaction was discarded and is not used at present. But it merits a description.

The threads are cut in short pieces, about an inch in length, and dipped in a solution containing germs, and are then dried, to make the germs adhere to the thread.

Sterilized tubes containing the previously prepared threads are filled with solutions of the disinfectant of different concentrations; with a platinum wire these threads are fished out at the required time, and after removal of the disinfectant placed in culture media. The removal of the disinfectant is effected by washing in sterilized water and pressing between sterilized filter paper. But there are objections to this method. It is hard to remove the disinfectant from the thread sufficiently enough to not inhibit the growth of the organisms that are not destroyed by its action. And we can not estimate

the number of germs exposed to the disinfectant nor the number that survive its action.

Second: By use of fluid cultures. This method was used by Geppert and Schafer; but as it did not give satisfaction, soon gave way to the exact dilution method, to be described later.

In this method, equal quantities of dilute and more concentrated solutions of the disinfectant are put in a number of sterilized tubes. With a sterilized dropping pipet, an equal number of drops of a well-shaken culture is added to each of the tubes, and mixed with its contents by gently shaking. The same number of drops of the same culture that is added to the disinfectant solution, is added to a tube of sterilized bouillon for the control tube.

A large number of tubes with 5 to 10 cc. of nutrient jelly or agar in each are kept at a liquefying temperature. From each of the disinfectant solutions containing the organisms, as well as from the control tube, one drop is transferred to one of the nutrient jelly or agar tubes, and the tubes placed in the thermostat. The same dropper being used in all to insure the transfer of about the same quantity in each one.

The objection to this method is that too much of the disinfectant may be transferred to the nutrient media with the organisms, and thus prevent the germ from growing when it is not destroyed and thus lead to deception.

In my experiments with carbolic acid, I have employed the exact dilution method, described by A. C. Abbot in the Johns-Hopkins Hospital Bulletin, in his article on corrosive sublimate, of which I will give a description.

Fluid cultures, or watery suspensions of the organisms were mixed with carbolic acid solutions in such proportions that the organisms were in a fluid containing the acid in the required proportion, 2:100, $1\frac{1}{2}$:100 or 1:100 as the experiments will show.

This was done by adding to 23.5 cc. of distilled sterilized water .5 cc. of acid; this was thoroughly shaken and allowed to stand until the acid was dissolved; then 1 cc. of bouillon culture of the organisms was added, and gently shaken to distribute the germs through the solution.

This gives us a 2 per cent. solution of the acid, which was used throughout the first series of experiments.

As soon as possible after the bouillon culture was added, with a sterilized dropping pipet, one drop of the acid solution containing the organisms was transferred to 10 cc. of distilled sterilized water, and the water well shaken. With the same pipet after it was sterilized in a Bunsen flame, one drop was transferred from the water to 10 cc. of nutrient agar, and the agar plated according to the Koch method. Cultures were also made after five and ten minutes exposure to the acid.

The control plate was made by adding to 24 cc. of distilled sterilized water, 1 cc. of the same bouillon culture used in the acid solutions, and the same dilution carried out. By this method it is easy to see that only the merest trace of acid is transferred to the agar plate with the organisms. The dropping pipet dropped fifty-two drops to the cc, therefore the acid would be present on the agar plate 1:13,520,000. Not enough to inhibit the growth of the organisms that were not destroyed by the action of the acid.

Throughout these experiments there will be noticed certain minor irregularities, that is, occasionally there is found more colonies on a plate made after ten minutes exposure to the acid than on one made after five minutes. This is explained in no other way than that we are dealing with a mechanical suspension of solid particles in a solution, and one drop of this solution may contain a great many more germs than another, or clumps may be formed containing a very large number of germs. In the latter case it would require longer exposure to the acid to kill all the germs.

In these experiments I did not filter the bouillon culture, as A. C. Abbot did in his work, with corrosive sublimate, but used it just as the germs grew in the tube by only shaking it well just before it was used to distribute the germs through the bouillon as evenly as possible; and then if any clumps existed they would be exposed to the acid under conditions more similar to those met with in the disinfection of wounds.

The staphylococcus pyogenes aureus was used in most of these experiments, because it is the germ against which our

efforts of destruction are most often aimed, and to test the acid on a spore-producing germ, the bacillus subtilis was used. The virulence of the staphylococcus pyogenes aureus used was demonstrated by it producing an abscess under the skin of a rabbit inoculated with it; also by it causing the death of a rabbit inoculated in the vein of the ear.

EXPERIMENTS.—SERIES I.

Throughout the first series of experiments the organisms were exposed to a two per cent. solution of the acid, and the experiments all made the same.

PLATE I.—September 8, 1. cc. bouillon culture of the aureus 3 days old; 23.5 cc. of distilled sterilized water; .5 cc. acid; control plate, too many to count; immediately, 48; five minutes, 5; ten minutes, 0. Counted after 72 hours.

PLATE II.—September 12, bouillon culture of aureus 7 days old; control plate, too many to count; immediately, too many to count; 5 minutes, 23; 10 minutes, 0. Counted after 72 hours.

PLATE III.—September 14, bouillon culture 3 days old; control plate, too many to count; immediately, 97; 5 minutes, 1; 10 minutes, 0. Counted after 48 hours.

PLATE IV.—September 16, bouillon culture 24 hours old; control plate, 68; immediately, 2; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

PLATE V.—September 17, bouillon culture 48 hours old; control plate, 89; immediately, 1; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

PLATE VI.—September 18, bouillon culture 72 hours old; control plate, too many to count; immediately, 61; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE VII.—September 21, bouillon culture 48 hours old; control plates, 710; immediately, 2; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE VIII.—September 22, bouillon culture 4 days old; control plate, estimated at 8,640; immediately, 34; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE IX.—September 22, bouillon culture 48 hours old;

control plate, 312; immediately, 0; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE X.—September 23, bouillon culture 48 hours old; control plate, 830; immediately, 2; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE XI.—September 23, bouillon culture 3 days old; control plate, estimated at 1,553; immediately, 942; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

SERIES II.

Throughout this series the organisms were exposed to a one and one-half per cent. solution of acid. This was prepared as follows: To 94.5 cc. of distilled sterilized water, 1½ cc. of the acid was added; after the acid was thoroughly dissolved 24 cc. of the solution was measured into a test tube, and 1 cc. of the bouillon culture of aureus was added.

PLATE I.—September 24, bouillon culture 48 hours old; control plate, 253; immediately, 3; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

PLATE II.—September 24, bouillon culture 48 hours old; control plate, 296; immediately, 10; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

PLATE III.—September 26, bouillon culture 3 days old; control plate, too many to count; immediately, 630; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

PLATE IV.—September 30, bouillon culture 48 hours old; control plate, 367; immediately, 1; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE V.—September 39, bouillon culture 3 days old; control plate, 426; immediately, 2; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE VI.—September 30, bouillon culture 3 days old; control plate, 207; immediately, 109; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE VII.—October 3, bouillon culture 48 hours old; control plate, 207; immediately, 21; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE VIII.—October 3, bouillon culture 14 days old;

control plate, 239; immediately, 0; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE IX.—October 3, bouillon culture 14 days old; control plate, 198; immediately, 0; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

PLATE X.—October 4, bouillon culture 14 days old; control plate, 219; immediately, 3; 5 minutes, 0; 10 minutes, 0. Counted after 72 hours.

SERIES III.

Throughout this series the organisms were exposed to a one per cent. solution of the acid. This solution was prepared by adding to 95 cc. of distilled sterilized water, 1 cc. of the acid, and as soon as the acid was thoroughly dissolved 24 cc. of the solution was measured into a test tube, and 1 cc. of the bouillon culture of aureus was added.

PLATE I.—October 5, bouillon culture 24 hours old; control plate, 151; immediately, 92; 5 minutes, 10; 10 minutes, 0. Counted after 48 hours.

PLATE II.—October 5, bouillon culture 24 hours old; control plate, 198; 5 minutes, 102; 10 minutes, 20; 15 minutes, 0. Counted after 48 hours.

PLATE III.—October 5, bouillon culture 48 hours old; control plate, 648; immediately, 290; 5 minutes, 119; 10 minutes, 7. Counted after 48 hours.

SERIES IV.

Organisms suspended in a water solution, and exposed to a $1\frac{1}{2}$ per cent. solution of the acid. Prepared as follows: 5 cc. distilled sterilized water; 15 drops bouillon culture of aureus; 4 cc. acid solution, 3:100. For the control tube, 10 cc. of distilled sterilized water, 15 drops of the same bouillon culture.

Plate I.—October 8, aureus culture 3 days old. Control plate, estimated at 1,265; immediately, 112; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

Plate II.—October 8, aureus culture 5 days old. Control plate, estimated at 2,194; immediately, 185; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

Plate III.—October 10, made the same as plates I and II, using sterilized bouillon in the place of the water, as in I and

II. Bouillon culture of aureus 5 days old. Control plate, estimated at 1,293; immediately, 81; 5 minutes, 0; 10 minutes, 0. Counted after 48 hours.

Plate IV.—October 10, aureus culture 5 days old. Control plate, estimated at 2,136; immediately 0; 5 minutes, 0; 10 minutes, 0.

SERIES V.

The bacillus subtilis was used in this series to demonstrate the action of carbolic acid on spores. In the first three plates of this series, the organisms were exposed to a $1\frac{1}{2}$ per cent. solution of the acid. These plates were all made from the same bouillon culture of the organisms, 3 days old, which was filtered through glass wool to remove the enormous clumps which formed in the bouillon, thus making the result more uniform.

Plate I.—October 14. Control plate, estimated at 1170; immediately, estimated at 1,057; 5 minutes, estimated at 804; 10 minutes, estimated at 284. Counted after 3 days.

Plate II.—October 14, bouillon culture of subtilis 48 hours old. Control plate, estimated at 4,360; immediately estimated at 2,620; 5 minutes, estimated at 1,200; 10 minutes estimated at 630. Counted after 3 days.

Plate III.—October 14, bouillon culture of subtilis 48 hours old. Control plate, estimated at 930; immediately estimated at 568; 5 minutes, estimated at 420; 10 minutes, estimated at 210. Counted after 3 days.

In the three following plates, the organisms were exposed to a 2 per cent. solution of the acid, the bouillon culture 6 days old, filtered through glass wool.

Plate IV.—October 17, bouillon culture of subtilis 48 hours old. Control plate, estimated at 1,218; immediately estimated at 936; 5 minutes, estimated at 520; 10 minutes, estimated at 118. Counted after 3 days.

Plate V.—October 17, bouillon culture 4 days old. Control plate, too many to count; 5 minutes, estimated at 1,400; 10 minutes, estimated at 1,100; 15 minutes, estimated at 296. Counted after 72 hours.

Plate VI.—October 17, bouillon culture 4 days old. Control plate, too many to count; 5 minutes, estimated at 1,680;

10 minutes, estimated at 945; 15 minutes, estimated at 510. Counted after 72 hours.

In the three following plates, the bacillus subtilis was exposed to a 3 per cent. solution of the acid. The bouillon culture or subtilis was 24 hours old, filtered through glass wool.

Plate VII.—October 24. Control plate, estimated at 500; 5 minutes, 74; 10 minutes, 0; 15 minutes, 0. Counted after 72 hours.

Plate VIII.—October 24. Control plate, 496; 5 minutes, 89; 10 minutes, 0; 15 minutes, 0. Counted after 72 hours.

Plate IX.—October 24. Control plate, 647; 5 minutes, 84; 10 minutes, 0; 15 minutes, 0. Counted after 72 hours.

CONCLUSION.

The question now arises, what conclusions are we justified in drawing from this work?

1. I claim to be justified in asserting that carbolic acid is a disinfectant.

2. That a two per cent. solution of the acid will destroy the staphylococcus pyogenes aureus immediately on coming in contact with the organism.

3. That $1\frac{1}{2}$ per cent. solution will destroy these organisms within five minutes.

4. That a 1 per cent. solution will destroy these organisms within fifteen minutes.

That a 3 per cent. solution will destroy the spores of the bacillus subtilis within ten minutes.

A STUDY OF THE SPINAL CORD OF A SPRING-HALT HORSE.*

By T. L. BOLTON, M.D., Boston, Mass.

The horse from which this cord was taken had belonged to a farmer living near Boston. The animal was about twenty years old, and was known to have been afflicted with spring-halt five or six years before 1891, when it was destroyed. During this time it had become continuously worse, and at

* An abstract of a paper read before the Massachusetts Veterinary Association, at Boston, June, 1892. Reprint from *The Journal of Nervous and Mental Disease*.

the time of its destruction it was practically worthless. The attention of Dr. L. H. Howard, President of the Massachusetts Veterinary Association, was called to the animal in the summer of 1889. He gives this description of its symptoms and efforts at locomotion at this time: "The animal, on being moved, would pick up each hind leg with a quick, jerky motion, characteristic of spring-halt, but the great excess of motion seemed to be that of abduction: the whole limb would fly out away from the body, so much so that he would sometimes hit it against the shafts of the vehicle to which he was harnessed. The foot came back to the ground, however, in proper advance of the point of leaving it, and progression was accomplished after the animal was once in motion. The muscular contractions quickly diminished until they became nearly normal, and did not take place again while he was trotting. On dropping his gait to a walk, they would sometimes occur again for a few steps; when he had come to a standstill, then always on starting again the above-described movements would take place. These symptoms all the time increased until the animal came into our possession in the summer of 1891. He had then become an exaggerated case. The motion of abduction was now so excessive that he would throw the first limb lifted so high that he would lose his balance, and be obliged to hop on the opposite limb, when that in turn would fly out and up so high that over he would balance on the first one again, and thus he would 'dance the ballet' for several seconds before being able to progress at all. Finally the excessive contractions would subside enough so he could step forward, and he would trot off all right for a longer or shorter distance, when he would have to stop and again have his 'dance.' In some instances the throwing up of the limb would so overbalance him that he would fall to the ground. If moved suddenly in a stall of ordinary width, he would strike first one side of it and then the other several times with his hoofs." In June of 1891 the animal was placed in charge of Dr. Howard for experiment. He invited several veterinary specialists, who were interested in spring-halt, and who had theories of the nature of the disorder, to try their treat-

ment upon the animal, and supplied the means for doing so. Dr. Bryden alone accepted the invitation. He made a careful examination, and diagnosed the case as a disorder resulting from defective hoofs. This belief that a defective hoof was the cause of spring-halt he had been led to by his father more than thirty years before. This is his description of the animal and its pathological symptoms:

"The horse was a small black pony, about fourteen hands high, and twenty years old, apparently well enough, with the exception of hind legs, which were badly afflicted with spring-halt, both legs being nearly, if not quite, alike. In viewing the animal from behind, the crests of the ilium were not even. The gluteals were both alike flat, and the hips drooping, and the sacrum and tail elevated and coarse; the muscles to the stifle were somewhat wasted; the muscles behind the tibia were small, and felt like tendons to within two or three inches of their origin. The hocks were both coarse, but not more than ought to be expected under the circumstances, his age and the way he had been used for some time having tended to produce changes; both had a small elevation or slight coarseness at the seat of bone spavin. His legs below the hocks were always swollen, from the fact that when he attempted to move in his stall he struck his ankles against the sides with such force as to make and keep them sore."

Most of these symptoms will be recognized immediately as common to all cases of spring-halt. Dr. Bryden, believing that the hoofs were the primary cause, and that those other symptoms resulted from the disordered hoofs, gave special attention to them. He says:

"They were smaller than nature had intended them to be, and very nearly round; the wall short and very thick, the sole low, the bars strong, the heels short, and the frog of medium size. The horn seemed fairly healthy, but it grasped the extremity like a vise, causing him much uneasiness."

Dr. Bryden began his treatment upon the theory that the above-described symptoms were due entirely to the compression which the too small hoofs exerted upon the nerves and blood-vessels supplying the lower extremity. The hoofs were

thinned and pared down, and the frog thoroughly cleaned, and kept so. The details of his whole treatment are unnecessary. It will be sufficient to say that after two months' care and treatment the animal improved greatly. Dr. Howard says of this treatment, "that it caused a certain decrease of the excessive motion described, and we saw him on two or three occasions even start off without his customary introducing 'ballet.'" The recovery was not complete, and the treatment does not seem to have given evidence that the animal would ever have completely recovered, as it was destroyed. The spinal cord was taken out and sent to Dr. H. H. Donaldson, Assistant Professor of Neurology at Clark University. He placed it in my hands, and under his direction it has been examined with a microscope.

The specimen consisted of a section of the cord extending from the level corresponding to the eleventh dorsal vertebræ to the termination of the cord in the sacrum. The portion of the cord caudal of the origin of the fifth pair of lumbar nerves was so badly bruised in the process of removal from the vertebra that it was unfit for microscopical examination, save the roots and ganglia of the first and second pairs of sacral nerves, which were held intact by the dura mater. In addition to this were the roots and ganglia of the fourth, fifth and sixth pairs of lumbar nerves. The whole specimen was hardened in a 2.5 per cent. solution of bichromate of potash plus one-sixth its volume of 95 per cent. alcohol. In this fluid it remained for two months, when sections were taken from six different levels of the cord, and also the roots and ganglia of the fourth, fifth and sixth pairs of lumbar, and of the first pairs of sacral nerves, and completely hardened in strong alcohol. These specimens were then numbered to preserve the order, and sectioned. In staining, two purposes were kept in view: the first to show the fibres, and the second to show the cells. For fibre staining the best results were obtained with a double stain of palladium chloride and ammonia carmine. Other fibre stains were nigrosin, acid fuchsin and carminic acid. The most satisfactory cell stain was a double stain of Delafield's hæmatoxylin, and Van Giesen's picro-

fuchsin. As the cells did not show a regular and marked degeneration, we need not concern ourselves with them. The fibres alone seem to have undergone a regular degeneration. Beginning with the sections from the level of the eleventh dorsal nerve and proceeding caudal, the location of the degenerated nerve fibres will be pointed at the successive levels where specimens were taken. On a section from the level of the eleventh dorsal nerve a lesion appears in both the dorsal and ventral columns. In the dorsal columns it has a grosser appearance, and is not so diffuse as in the ventral columns. Large numbers of fibres have entirely disappeared from the region about both posterior horns of the gray matter. The degenerated areas are not quite symmetrical in the right and left halves of the cord. In the ventral columns the degenerated columns appear singly, as a rule, and are distributed around the periphery of the anterior columns as far as the points of entrance of the anterior roots of the spinal nerves.

There are in addition more or less degenerated fibres distributed throughout the entire section. The appearance of the section from the level of the first lumbar vertebra is similar to that from the level of the eleventh dorsal. In the posterior columns the lesion is somewhat more marked, but in the anterior columns it is less marked and not so closely confined to the periphery. On the section from the level of the fourth lumbar vertebra, no lesion, properly speaking, appears in the anterior columns, but it is perfectly plain in the posterior columns and involves a larger area of the section. The location about the posterior columns is about the same as on the other sections. As the animal was old and had been subjected to hard usage, the degenerate fibres in the anterior columns may have no pathological significance. The disturbance in the posterior columns is certainly significant of something more than the decay resulting from old age and hard usage. It is confined entirely to the sensory areas. The first indication of any degeneration is the failure of the myelin substance to receive a stain, and not unfrequently the fibre that fails to stain is swollen. The axis-cylinder is next to dis-

appear, and finally the medullary sheath, leaving an unstained gap in the section. A section was allowed to remain in nigrosin for twelve hours, and no stain of these areas was effected. These unstained areas can easily be seen without a glass, and was first noticed on an unstained section from which the alcohol was allowed to evaporate.

The results of the examination of sections taken from the ganglia of the fourth, fifth, and sixth pairs of spinal nerves are perhaps more interesting still. The ganglia were sectioned at intervals of one-eighth of an inch, and the order of these sections carefully maintained. The same methods for staining were used for these as for the sections from the cord. The most peripheral section of one ganglion showed that a single funiculus in the motor region had undergone complete degeneration. Proceeding toward the cord the successive sections showed that this funiculus became gradually broken up and distributed throughout the whole motor area of the section, for the degenerated fibres were found scattered in every part of the motor area. Although the disturbance in the cord was mostly confined to the sensory area, it is the motor fibres in the nerves that have suffered decay. No very careful and detailed study of the blood-vessels has been made, so that it cannot be definitely stated whether or not the lesion has resulted from a lack of blood supply. It is not deemed expedient to attempt to argue the consistency of a sensory degeneration in the cord and a motor degeneration in the spinal nerves. It is my purpose simply to state what appear to be the facts in regard to the condition of this cord. We have simply a coincidence: a horse is afflicted in a high degree with spring-halt, and a lesion has been found in the sensory areas of the cord and in the motor areas of certain nerves which control the hind limbs. Some veterinary surgeons have long supposed a central origin for the disease, or at least that the disease was nervous. The disease has resisted up to the present time all attempts at a cure, and the sale of a horse is greatly injured when it is known to be afflicted with spring-halt. As a means of getting a better understanding of the symptoms of spring-halt, I would suggest a careful study of

the cutaneous sensibility of the hind limbs. The history of the animal is also important in determining the cause.

Before closing this paper I wish to enlist the services of the members of this Association in obtaining further material for finishing a work that appears at present promising. I will take it upon myself to examine any material sent to Clark University, Worcester, Mass., and report the results of the examination to the person who sends it. The cord after being taken out (and the whole cord is desired) should be placed in a 2-5 per cent. solution of bichromate of potash plus one-sixth its volume of 95 per cent. alcohol, and expressed to the above address.

THE SCIENTIFIC INVESTIGATIONS OF THE BUREAU OF ANIMAL INDUSTRY.

BY D. E. SALMON.

(Continued from page 635.)

These inconsistencies show that the whole argument lacks candor or even a desire to reach the truth. It may be freely admitted with Frosch, and as we have shown in our reports, that this germ, in common with many others, varies greatly even in its staining properties when obtained from different outbreaks, or when grown under different conditions. The same is true of the swine-plague germ. This, however, does not prevent each from having its peculiar staining, which is valuable as a diagnostic point when taken in connection with other morphological and biological characters, but which alone is not sufficient to determine a species.

That the figures of the hog-cholera germ in our reports do vary somewhat as to the staining, as charged by Frosch, is not denied, but he surely is the last one to consider this as bearing against the value of our statements, for he expressly calls attention to the variations which are liable to occur and to the delicacy of the manipulations necessary to get comparative results. Our figures were drawn from the natural objects and were correctly drawn, if they had been diagra-

matic plates, such as adorn Billings' report, then an exact correspondence might have been expected. In spite of the variations, however, the difference in staining between the hog-cholera and swine-plague germs is very apparent in our plates, and can be relied upon as exact.

With organisms which vary in many of their characters to the extent which occurs in bacteria from slight changes in the conditions of life, it goes without saying that it requires skill to secure typical preparations, and even then such are not to be expected from all outbreaks. For that reason a safe diagnosis cannot be made from a single character, and above all is it unsafe and unscientific to reach positive conclusions from the simple microscopical inspection of a preparation, the germs of which have been cultivated, stained, and mounted by another person.

The examples of Billings' recklessness in this respect, and of his discomfiture, are numerous and instructive. Dr. Shakespeare, previous to his appointment on the Commission of Inquiry, sent him a photograph of a certain micro-organism, and inquired if it resembled the germ found by him in the swine-plague of Nebraska. Billings at once accepted it as identical with his swine-plague germ, showed it among his friends, and wrote it up in the newspapers as another proof of the correctness of his own conclusions and the incompetency of the Bureau. When the commission reached Lincoln, the members were invited to meet a number of scientists and people connected with the university, and at this gathering Billings made an address. Among other things he made a strong point of the confirmation which his work had received from the investigations of Shakespeare, and exhibited the photograph as proof positive that the latter had isolated the same germ from hog-cholera which he himself claimed to be the cause of that disease. To no one was this greater news or more of a surprise than to Shakespeare himself, who was obliged in self-defense to explain that the germ in question was not obtained from a sick hog but from a person affected with some bowel disorder, and he had no reason to suppose it had any relation to any swine disease.

His alleged discovery of the germ of yellow fever is only another example of the same ridiculous blundering. He claimed to have found the organism described by Babes, in 1885, in specimens from seven cases of yellow fever, and that in only one case was there any pollution. Of these investigations he wrote: "I am willing to risk some considerable reputation that the germ herein described as present in all this material is the specific cause of yellow fever, as well as that the description of the morpho-biological phenomena presented by the germ of the southern cattle-plague will largely be found applicable to this" (Original Investigations of Cattle Diseases in Nebraska, 1886-1889, p. 116).

Now what are the facts about this? In his recent report Sternberg gives a history of this material, and of the results of a careful examination of it by different experts. The bacillus of Babes, alleged by Billings to be present "in every section and in great numbers," is conclusively shown to have been absent from the specimens which he referred to with greatest confidence, and probably did not exist in any of the specimens which he examined. These specimens did contain the *bacterium coli commune* and other organisms which represented a *post-mortem* invasion of the tissue (Report on the Etiology and Prevention of Yellow Fever, by George M. Sternberg, Washington, 1890, pp. 176-180). His identification of the Babes germ is therefore on a par with his identification of his swine-plague germ in the photograph sent him by Shakespeare, and his much vaunted yellow fever investigations turn out to be a farce of the most absurd character.

To come back to Billings' opinion of the slide sent him by Detmers, it can be seen that it was formed with the same kind of evidence as his opinion of the Shakespeare photograph and of the yellow fever germs. As evidence of the kind of germ, this opinion, from the nature of the case, can have no weight, but as evidence of the care or lack of care shown in reaching his conclusions it is incontestible.

Detmers, who studied the germ from which the slide, was made, both in cultures and by the inoculation of a rabbit, decided that it was entirely different from his swine-plague,

and as Frosch remarks "on the very remarkable ground that the *post-mortem* lesions found in the rabbit were not like those he was accustomed to see in pigs." Detmers and Billings were both positive on two points—first, that their swine-plagues were identical, and, second, that this germ, discovered by the Bureau was entirely unlike the germ of their disease.

Detmers said: "I cannot identify it with swine-plague. If it is identical with it, then I must say the disease I heretofore pronounced swine-plague, or, as the farmers call it, hog-cholera, must be bogus; that is, something else. I am compelled to pronounce the disease of which the rabbit died a fatal septic disease entirely different from swine-plague." Again, he says of the disease produced by this germ, "It is a septic germ, readily kills rabbits and causes septicæmia, but has no connection with the disease in question. It is not for me to say where Dr. Salmon obtained it, or from where he may have imported it" (Billings' report on Swine-Plague, pp. 249 and 257).

Billings himself took the same ground, for he remarked: "Swine-plague itself being a septicæmia, may it not be possible that Mr. Salmon has accidentally dropped upon some kind of a septic organism capable of producing the same lesions?"

"This question has been frequently in my mind of late, for if not so, I do not know how to answer for all Mr. Salmon's wonderfully positive experiments. If not so, then these experiments were never made, and the whole thing is a concocted farce, or else he has been secretly using the real germ and showing people this other thing. I am determined to force this question to such an issue that the real facts must come out sooner or later, for I, as repeatedly said, have no fears but what my own work will stand every test" (L. c., p. 249).

Here are the two positions, which side was correct? The investigations of von Esnarch, Frosch, Bunzl-Federn, Racuglia, Afanassieff and others leave no doubt as to the reality and pathogenic effect of our hog-cholera germ. Billings himself has since adopted it, but what microbe did he and Det-

mers have at the time they were making such charges against the Bureau? Surely if they had ever seen the hog-cholera germ they would have recognized it in this culture which Detmers obtained from Persh. If they had not seen it, then what becomes of the claim, made by them both, that Detmers is entitled to the credit of its original discovery?

I do not propose at this time to follow these critics through any more of their inconsistent and contradictory writings. I have done this much to show you the quality of the investigations which are held up to you because they are "recognized as good abroad, and cannot be ignored at home." If the general conclusions of a man's investigations are so absolutely wrong, how can the details upon which these are founded be any nearer right? We might and should excuse errors or apparent errors of detail, but how can you accept a work which is wrong in its principal conclusions?

The principal conclusions of the Bureau reports as to the existence of the hog-cholera and swine-plague germs in this country have been confirmed on all sides. The doubts of European investigators as to the correctness of these conclusions have been withdrawn. What discoveries of value have been made regarding the biology of the hog-cholera or swine-plague germs by other American investigators, and have been satisfactorily confirmed? If, on the other hand, you compare the report of Frosch with the Bureau reports you cannot fail to observe how many of his conclusions were previously announced in our reports.

Does this Association take no pride in the investigations of the Bureau of Animal Industry, or does it propose to stigmatize them as a disgrace to the veterinary profession? Is it willing to brand them as discreditable and the men connected with them as ignorant, incompetent and dishonest on the evidence which has been submitted? Do you forget that Billings has vilified about every scientist whose reputation might serve him as a stepping-stone if he could once get it under his feet?

Why then are these reports of his, which contain no discoveries of value, if they contain any discoveries at all, re-

ports which are filled with the most brutal personalities, which give no account of experiments conducted in a scientific manner, which are lacking in those details necessary for their confirmation by other investigators, which above all are manifestly wrong in their principal conclusions—why are these reports now held up before us as too good to be ignored, and the reports of the Bureau of Animal Industry, written in part by members of this Association, denounced as they have been? Are you aware that this report of our committee was no sooner published than it was circulated broadcast by Billings as another vindication of his work and his methods? Do you not know that he is repeating with Texas fever the role which he played with swine diseases—denying the existence of the true germ, and claiming the discovery of something else? Why should this Association go out of its way to assist such a man in obstructing the progress of science and in vilifying its own members?

Gentlemen, I leave the matter with you, knowing that my own work has been carefully and conscientiously performed, and with the full confidence that every detail in the work of my scientific assistants has been done with equal care and honesty. It is for you to decide whether such reports from one of our leading committees are to be endorsed and encouraged. I express no opinion as to the honesty of the committee, but I do charge that its report was incorrect in both its statements and its conclusions, and inexcusable in its personalities. I do insist that this Association cannot afford to endorse such a report or to allow others like it to be presented in the future, whether they affect me or any other member of this Association. The truth will finally prevail, no matter what our action may be, but if such mischievous reports continue to come from a leading committee you will be responsible for the loss of prestige, and influence to the Association and the loss of good will between members which must necessarily follow.

REPORTS OF CASES.

"Careful observation makes a skillful practitioner, but his skill dies with him. By recording his observations he adds to the knowledge of his profession, and assists by his facts in building up the solid edifice of pathological science."—VETERINARY RECORD.

A NEW CATTLE DISEASE (Epizootic or Enzootic Chorea).

By T. J. TURNER, D.V.S., State Veterinarian, Columbus, Mo.

History.—This trouble first made its appearance about three years ago among the animals of a stockman of Missouri, but no alarm was taken, as only a few were affected, and no danger suspected to others. No word was sent to this office on this account. Being away from home on business, and in the vicinity of the malady, I was fortunate enough to see the few cases that then existed. I visited the farm, and made a casual examination of the animals diseased. After obtaining all the history possible of the outbreak (not then considered as such), I concluded that these were simply individual cases; that the disease was probably of a general nervous nature, due possibly to the breeding of the animals (they having been inbred slightly). Giving this as my opinion I gave or advised no treatment, but objected to the breeding, and advised the discontinuance of such methods. These animals came frequently under my observation, with the symptoms very little, if any, augmented for about two years. Some affected would at times apparently get better and recover; then again one or two more would become affected with the same symptoms. Still no serious trouble was anticipated, no deaths having occurred. The cases continued with but little change until a few months ago, when I was notified officially, and requested to visit the locality and investigate the trouble. I did this, and find upon my arrival quite a number suffering. Some two or three had died, and the number of cases was increasing very rapidly.

Symptoms.—They are of gradual development. The disease, of whatever nature, its operating cause is manifest purely by nervous affection. At its incipency the animals

quiver and tremble as though palsied; they are unable to keep the head quiet, it being in a constant quiver; their eyes have a peculiar, starry look and fixity of expression. In the movements, the animals simulate the gait of one affected with locomotor-ataxia. This is during the first stages. As the disease progresses, the tremulous motion of the head continues with much exaggeration. The gait changes somewhat, the symptoms peculiar to an animal suffering from laminitis being added to that one already noted. These symptoms continue to increase in severity, with additional ones added. Now, we have tetanic convulsions upon any excitement. Co-ordination becomes almost impossible, the animals falling over in a convulsion; the muscles of the whole body become tense and rigid, the limbs entirely stiff, and should any motion be attempted the animal will topple over. The appetite is splendid, and usually digestion is good; I have, however, since this outbreak heard of some that had diarrhea. This latter symptom has not occurred in any that came under my own observation. These symptoms increase, involving all the muscles of the body, and the poor animals will pass off in one of the convulsions.

Distribution.—Not widely disseminated, yet it is not confined to one farm or community. Since the outbreak herein described, several more of such instances have occurred. Several persons in the same county have cited instances in their own herds, where a few have been and were affected. Again, this disease exists in several neighboring counties. The death rate so far being small, but little alarm has been taken, and for this reason we have not heard of as many cases of this malady as do exist.

Etiology.—Of this we are not able definitely to speak, for thus far we have been unable entirely to account for a cause. First, search was made to find if the animals that were in the neighborhood that was affected were not all related to those that were first affected with this disease. This was with a view to find out if the particular breed had anything to do with it, or any especial family were affected. This idea, viz., that of heredity, proved of no avail, for shortly animals of

an entirely different breed were found to be affected. Now, two ideas, that of a peculiar manner of breeding and inherited disease, have been dispensed with. Next the pastures were examined, and no cause found, the animals running on blue grass pasture and high rolling, well-drained land, no swamps or low land being accessible. These pastures have not been ploughed for twelve or fifteen years. Failing so far, the next step was that of supposed microbic origin, the disease lately seeming to be infectious or contagious, so frequent have been the new cases developed. So far there have been no positive results in that line of research. Having decided to try and find the real cause by means of the microscope, an animal near death was selected and destroyed.

Post-mortem.—Before speaking of the post-mortem proper, I will call attention to the method used to throw the animal. Being very bad, locomotion was necessarily slow and irregular. He was urged along very slowly to a point where we wished to destroy him. Just at this point I walked up closer, and as I did so the excitement was increased, which in the same ratio decreased the speed, until finally the poor beast was unable to move, and looked as though it were tied to the spot. Then by laying the hand upon the animal's back with a light tap, it would drop over as though it were knocked down, its muscles being perfectly rigid. At this stage it is unable to rise until after some minutes have elapsed. The post-mortem revealed nothing, all the internal organs appearing normal, and the different apparatuses appearing perfectly healthy. This was a disappointment. The nerves, together with the spinal cord and brain, with their meninges and substance, failed to show any change so far as gross anatomy was concerned. After the post-mortem, portions of the nerves, the spinal cord, the whole brain substance, together with its meninges, were obtained, from which cultures were made and of which a microscopic examination was made.

This examination revealed an atrophy of the nervous structures, and in some parts only the axis cylinder remained, existing as a string. These experiments are still in progress, though no positive results have so far appeared.

Treatment.—Not being positive as to the nature of the malady, no direct line of treatment in the way of medicines can be advised. The treatment, however, may consist of two orders, viz., prophylactic and curative.

Prophylactic.—Remove healthy from diseased. Change food and water. Change all stock if upon a low land pasture to high land, and burn or bury those that succumb to the malady.

Medicinal.—Use nerve tonics and general strengtheners, such as nux vomica, gentian, ginger, Fowler's solution of arsenic, sulphate of iron or potassium of iodide. Those remedies may prove of benefit to those affected in arresting tissue metamorphosis or degeneration. Again, antiseptics may be used with benefit, and in cases where diarrhoea is present a good purgative followed by oleaginous drinks will be productive of good.

TRAUMATIC PERICARDITIS.

By T. B. ROGERS, D.V.S. Woodbury N. J.

CASE 1.—Knitting-needle laying free in the right ventricle, breathing difficult and painful œdema of the dewlap, cough, considerable dullness on percussion over left lung. Case destroyed as suspected contagious pleuro-pneumonia. Post mortem showed peri and endocarditis with congestion of the lung.

CASES 2, 3, 4.—The presence respectively of pieces of plain ribbon and barbed wire in the ventricular mass at the base of the heart, symptoms like preceding; condition not diagnosed before death.

CASES 5, 6.—Pieces of umbrella wire and a tenpenny nail respectively, in ventricular mass near its base, œdema of dewlap, dullness of left chest low down, muffled sounds of the heart, *painful breathing, all symptoms much augmented on exercise*; condition diagnosed correctly before death.

CASE 7.—Cough, painful breathing, great pain on intercostal pressure, no œdema of dewlap, area of dullness of cardiac region increased, *condition came on gradually, symptoms increased in severity on exercise*; diagnosis, traumatic pericar-

ditis. Autopsy revealed tubercular deposits through the entirety of the muscular substance of the heart, breaking down of some of these nodules gave rise to peri and endocarditis.

CASE 8.—Cow gave seven quarts of milk at night, eat her feed, and was found dead in the morning.

History, about three months previously had an attack of what his owner described as "difficult breathing like a horse with lung fever;" this passed off and was succeeded in a few weeks by a marked rigor; after this the cow returned to an apparently normal condition, and so continued until her sudden death. Autopsy revealed a large heart, bound down so firmly to the sternal pleura that in order to remove the viscera intact it was necessary to resect a portion of the sternum. The left ventricle was pierced near its apex by a very sharp, imperfect (headless) eightpenny nail, the pericardial fluid was small in amount, free from flakes of fibrin or pus, and while at a few points the sac was adherent to the heart, the adhesions were not many or formidable. The canal traversed by the nail evidently closed immediately after it, preventing access of air, and consequent decomposition of the wound secretions; the auricles and ventricles were all filled with large, soft, post-mortem clots, extending some distance with the real vessels; there were small, recent extravasations with the newly formed tissue at the apex of the ventricle, and on cutting into the neoplasm about two tablespoonfuls of thick, creamy, odorless pus, looking much like the pus of a strangles abscess, was evacuated, no endocarditis, valves clean, muscular substance hypertrophied, though Professor Harger thought there was some thinning of the wall in the neighbourhood of the injury. This is a very instructive case. The passage of the foreign body from the stomach to the heart was marked by the period of difficulty of breathing, the rigor heralded the formation of pus, yet for weeks this cow kept in good form, eat her rations and gave her quantum of milk with this nail in her heart; the absence of symptoms in this case and the progressive aggravation of symptoms as the traumatism approaches the base of the heart, and especially as the right

heart becomes involved, have a diagnostic value. I feel justified therefore in advancing the following :

1st. That traumatic pericarditis may be usually diagnosed during life ; that its symptoms are dullness, low down on the left side of the chest, muffled heart-sounds, breathing painful rather than difficult, often grunting, pain on percussion over the lumbar insertion of the diaphragm or between the ribs, œdema of the dewlap, the pain of respiration being very much augmented on exercise.

2d. That the position and length of the foreign body may be approximated by considering the gravity of the symptoms, the greater the amount of pericardial exudate and subcutaneous œdema, the greater the probability that the intruding body is acting as a seton, and permitting access of air and fluids from the stomach to the pericardial sac ; if the body is short, the wound may close in its tract. The nearer the apex of the heart the milder the symptoms, and vice versa. If very great disturbance of respiration is present the presumption is strong that the right heart is involved.

3d. The tolerance of the heart to the irritation of these invading bodies holds out hope that in the future surgery may offer relief from what must be regarded as an almost surely fatal condition. I do not believe that removal would add to the risks of a condition bringing the patient into the shadow of death, and I shall carry out my conviction of this by operating on the next patient that comes under my care.

A SUPPLEMENTARY MOLAR.

By A. D. GALBRAITH, D.V.S.

A sorrel mare, eight years old, was brought to my hospital April 10th, 1885, with the history that she had been losing flesh for two or three months, and had trouble in mastication, and had not taken any nourishment for several days.

The mare was considerably emaciated with an excessive flow of a fetid, ropy saliva from the buccal cavity. An examination revealed a foreign substance in the right cheek, and after removing a half pint or more of partially masticated

food, I found a supernumerary tooth that had grown out into the cheek, at an angle of about 45° , from between the roots of the second and third molar teeth of the right superior maxillary. I extracted the tooth, which measured five-eighths of an inch and three inches long. The tooth had almost cut through the cheek. The parts were cleansed antiseptically, which healed rapidly, and the mare soon regained her former condition.

DOUBLE FECUNDATION—DIFFICULT DELIVERY.

BY THE SAME.

I was called twelve miles in the country to a three-year-old Jersey cow, that the owner said had been trying to calve for two weeks.

I found her having an occasional light labor pain and dull; temperature 102° , and pulse 50° . An examination revealed a complete obliteration of the os uteri, and as I could not find an opening, I made a T-shaped incision through the parts with an embryotom, which allowed a portion of the liquor amnii to escape.

I then delivered a living calf, and on inserting the hand to remove the placenta I found another foetus, which was delivered alive.

I then removed the foetal membranes, washed out the uterus, gave the cow a stimulant and had the calves cared for. The cow and calves recovered and did well. This was the cow's second parturition, and the occlusion was probably due to development of cicatricial tissue from injuries sustained in her previous parturition.

CONGENITAL DEFORMITY OF PREMAXILLÆ.

BY J. F. PEASE, D.V.S.

The horse under consideration is a blocky bay gelding about seven years old.

Something over a year ago he was brought to my office to have his teeth examined.

I found the premaxillary bones bent downward at nearly

a right angle in the region of the canines, the analogous portion of the submaxilla being bent upward in the same manner. The owner had noticed the condition at birth, and attributes it to an injury the mare had received in pregnancy—too late, however, in my opinion, to have influenced the growth of the bones to this extent.

When first seen by me the lower incisors (nippers) in passing, just touched the upper nippers, thus enabling him to eat corn from the ear.

As the lower incisors did not touch the gums at the angle formed by the deformity of the upper jaw, I did not operate, as by so doing the teeth would not touch at all in



passing. Several months later he was seen to fight with one of the farm horses, immediately after which he refused to eat anything but chop feed, and was brought in for operation.

The appearance of the upper angle indicated wounding by the lower teeth and some absorption of bone.

I clipped the corners and dividers with the ordinary incisor cutters, but to get at the nippers it was necessary to pull the jaw to one side. In so doing the upper jaw broke off in my hand at the angle. I finished the clipping with the molar cutters, and sent him home to be fed on ground feed and cut hay.

The owner thought the horse had wholly or partially

fractured the jaw at home, as it broke off with comparatively slight traction.

However it occurred, the bones united with no trouble and the deformity as shown in the picture is less, than first. After the photograph was taken the incisors, both upper and lower, were clipped as short as I thought it safe for the vitality of the dentine.

EXTRACTS FROM GERMAN JOURNALS.

By RICHARD MIDDLETON, D.V.S., Philadelphia, Pa.

ATMOSPHERIC EMBOLI FROM PROLAPSUS UTERI.

Following manipulations for the removal of the foetal envelopes, and directly ascribable to the same, there occurred a prolapsus of the womb. Frohner-Hunfeld found the cow breathing heavily, under labor, and with an accelerated heart. The hernia was replaced, but early afterward renewed itself, and was the second time successfully put in its normal position. As an anodyne application, an infusion of various agents was injected, to which the patient had great objection, springing violently here and there; suddenly she assumed a tranquil demeanor, swayed momentarily, plunged, and was dead.

The autopsy, held directly after death, gave no abnormal formation; pericardium, myocardium and endocardium in perfect health; blood of right auricle and right heart proper bright red, having coagulated particles and atmospheric air incorporated in its substance. From this we conclude death to have resulted from entrance of air into the venous circulation. The post-mortem being held immediately after death leaves no room for the supposition that the gas here found was but the natural result of decomposition.

F. assumes the entrance to have occurred through the venous system of the uterus, a possibility already pointed out by Prof. Harmes in his endeavor to ascribe puerperal apoplexy to this cause. He offers the following opinion: Previous to each labor pain or other action calling the abdominal

walls into play, the thoracic cage is expanded by the deepest possible inspiration, expiration being synchronous with labor. The space occupied by the heart is narrowed, and the afflux of the venous blood hindered; the blood supply in the major circulation is augmented, and the blood pressure is as indicated by Valsalva in his experiments. From the muscular activity, the gaseous interchange and demand for oxygen are enhanced; the respiratory acts being momentarily impeded, carbon di-oxide accrues in irritating quantities, and produces involuntarily a deep inspiration. The result of this is that the chest, being expanded, the heart likewise becomes suddenly larger, and the venous stream accelerated. The negative pressure in the large veins reaches its maximum, while the positive pressure of the superimposed muscles also diminishes. It may now be comprehended how the actual entrance of atmospheric air into a vein of the uterus is theoretically possible.—*Deutsche Zeitschr. f. Thiermed.*

PLEURITIS CURED BY THORACENTESIS.

Ribaud primarily asserts that puncture of the thorax is unfortunately too late, or not at all performed in veterinary practice. The author (Ribaud) handled a case of pneumonia in the horse by bleeding, and later applying a sinapism to the thoracic walls. On the fifth day of the diseased process, pleurisy aggravated the patient. The chest was now subjected to an epispastic composed of cantharides, mercury and camphor, the animal receiving contemporaneously potassi nitras, calomel and digitalis internally.

Since the exudate continued to slowly increase, Ribaud performed thoracentesis upon the right side, and obtained seven quarts of fluid. On the following day eleven quarts were obtained from the left side, and on the third day subsequent the right side again yielded seven quarts of the serosity. After each puncture the thoracic walls were rubbed with gray mercury salve, and diuretics administered internally. In approximately five weeks the horse was cured.

The second instance was that of a six-year-old, half-blooded

mare that had been kicked upon the right chest wall. After the animal had been driven about two miles symptoms of a bi-lateral pleuritis developed themselves. From the examination Ribaud noted the presence of considerable serum in the pleural sac. He immediately relieved the patient of twelve quarts of the exudate, and gave the same internal medicines as in the previous case. On the second, fifth, seventh and ninth days after, the thorax was alternately right and left punctured, and eight, seven, four and two quarts respectively removed therefrom. Under this treatment the condition of the mare improved, and after the expiration of the fourth week the hydrothorax had entirely disappeared.—*Ribaud Wochenschrift*.

DETECTION OF HORSE MEAT.

Until very recent times, the detection of horse meat when mixed with or placed adjacent to other meat was impossible. Nietel considered the glycogenic quality of this meat as sufficient proof. He was led to test for glycogen by the discovery of Limpricht that dextrin occurred invariably in horse meat.

As a matter of fact, Nietel found by Kulz's method the amount to vary from 1.07 to 0.37 per cent.; the meat used had stood from three to ninety-six hours after slaughtering before the analyses were made. Beef possesses but the slightest trace if any glycogen, the greatest per cent. reaching but 0.2; in pork and mutton, glycogen is never present. The least possible quantity found in horse meat is considerably larger than the greatest possible per cent. in beef.

Since the glycogen becomes transformed into grape sugar in the process of storing the meat, the latter should also be tested for. The quantity of grape sugar in this flesh is also greater than in other meats. The total amount of carbo-hydrates in horse meat is between 3.8 and 6.2 per cent., while in other meats the highest (calf) is but 1.2 per cent. This difference remains when the various meats are cooked, smoked, or made into sausage.—*Med. Centrbl.*

TUBERCULOSIS OF THE IRIS AND CHOROIDITIS.

A six-year-old cow that had calved four times failed to conceive again, and was put through a process of fattening. Toward the end of August she exhibited symptoms of an extended subacute conjunctivitis of a suppurative nature, accompanied by great swelling of the lids, and with corneal opacity. The treatment was useless.

By the beginning of October atrophy of the bulbus was present; the eye was contracted, hard and blind. About the middle of October the left eye became involved in the same process of destruction. On the 10th of December, the lacteal secretion appeared coagulated, and otherwise altered; on 12th of December, the cow became very weak in the posterior limbs, and on the 16th of January she was utterly unable to rise from the reclining posture. All the symptoms of an acute metastatic arthritis were present in anterior and posterior extremities.

Autopsy.—The left eye-bulb half as large as the right one; cornea and vitreous humor of the same clouded; in the parenchyma of the iris, and in the choroid coat, nodules the size of millet seed, composed of caseous contents. The right bulb nearly normal in size; cornea opaque; anterior chamber containing numerous white points; the vitreous body and lens transparent; upon the internal side of the iris a thin, fibrous coat; in the lungs caseous herds as large as a nut; mediastinal glands enlarged and caseous; in the synovial capsules abundant secretion; supra mammarian lymphatic glands hypertrophied.

Diagnosis.—Pulmonary phthisis with parenchymatous mastitis, tuberculosis of iris, choroid coat and bulbus.—*Schweiz Arch.*

CORRECTION.

“SEEDY TOE.”

We take pleasure in correcting a typographical error in the above named article written by Dr. W. Bryden as published in our last issue. At page 611 on the 8th line from the foot of page the words *perforatus* should read *perforans*.—ED.

CORRESPONDENCE.

EPIZOOTIC LABI-GLOSSITIS.

ELGIN, ILL., Feb. 6, 1893.

Editor Vet. Review :

I am only too glad to help you in any way in the good work you are doing, so have sent you the following report of a disease which has prevailed to a very considerable extent in this neighborhood. I have called it epizootic labi-glossitis, those organs being most affected.

This disease affects both horses and cattle, but is most prevalent in the latter. My attention was first called to it in 1892, in the following manner:

I was requested by Mr.——, a large dairy-man in Kane Co., Ill., to visit his farm and examine his cows, as they were not giving near the milk they should, and would not eat. Upon arriving, I found in all 26 cows affected with the disease in a more or less advanced stage. The symptoms were more or less as follows: Temperature from 2 to 4 degrees above normal; bowels constipated; saliva was flowing very abundantly, in some cases, as much as half a gallon being upon the floor before one cow; the tongue was protruding and raw; muzzle dry; appetite more or less impaired; in some cases, tongue and lips so sore that cows were not able to get feed into their mouths. Pulse varied according to severity of the case.

The disease generally makes its appearance in the following manner: A small blistered condition is first observed upon the inferior portion of the upper lip; the blisters break, leaving a raw surface which soon becomes ulcerated and extremely painful, rendering mastication difficult. The tongue is generally the next organ affected, first being blistered, the skin peeling off and ulceration setting in, the organ swelling in some cases as large again as it should be, and being extremely painful and hot. Saliva flowing in great abundance, being hot and sticky. The disease extends as far back as the pharynx and larynx, in some cases—when it must be regarded as very serious—the animal exhibiting all the symptoms of

acute pharyngitis and laryngitis. The muzzle in some cases becomes affected, also the lower lip, but very rarely.

The disease generally gets worse for about 10 or 14 days, and then gradually improves, providing ulceration is not too extensive, or animal too emaciated, when recovery is very slow, if at all. I have seen cases in which portions of the tongue slough off. But should disease be light, after two weeks a gradual improvement takes place, and animal recovers in from one to two months.

Some farmers claim cows that have had the disease never give so much milk again, and therefore sell them for beef as soon as they are sufficiently recovered.

In horses the disease is very similar, but attacks the tongue first, then the cheeks, is more severe and of shorter duration.

The disease is by some thought to be caused by some irritant upon the feed as it grows in pasture, or some weed, but I think this can hardly be, as I have seen it in the city affecting horses that receive no feed grown in districts where the disease abounds.

Most cases I have seen have been along rivers or creeks leading from or receiving water from slews, and cattle and horses feeding in slews are most affected. I am rather inclined to think it is caused by a germ, and that the germ is in the drinking water.

From the following case I would think it is contagious: A gentleman had a horse affected and had to lay it off work and get a fresh horse to take its place; one week afterwards this horse was also taken with the disease.

I have also seen cows taken into a barn where infected animals had been, and used same water, that were soon affected.

I am sorry to say that I did not have any specimens prepared for the microscope, but should it occur again next summer will certainly do so.

Treatment is very successful. I have always used the following for cows: give $\text{ol. lini raw } \mathfrak{D}ij$, repeat every five days; wash out mouth well with warm water containing about half dram carbolic acid to 3 pints; then dress wounds with boracic ac. $\mathfrak{Z}j$, glycerine $\mathfrak{Z}viii$, use these twice daily. Give

laxative food, boiled oats, bran, corn, carrots. The above is for ordinary cases. Very severe cases must have stimulants, febrifuges, or tonics, as symptoms require.

Very respectfully,

R. W. TUCK, V.S.

TO VETERINARIANS U. S. ARMY.

FORT RENO, O. T., Feb. 8, 1893.

I regret to have to state that we have failed in our efforts to pass our veterinary bill through Congress this session.

Would respectfully urge that we renew our efforts towards passing a suitable bill next winter, and would suggest that with this object in view you would endeavor to visit Chicago next September, during the session of the U. S. Veterinary Medical Association there, where as many as possible of the Army Veterinarians can meet and discuss the subject and organize an association for our protection and benefit. Those who have promised to be present, so far, are Drs. Turner, 6th; Treacy, 8th; Lemay, 7th; and myself, 5th.

Very respectfully,

GERALD E. GRIFFIN,

POSITION AS ASSISTANT WANTED.

Senior Student at the American Veterinary College, expects to graduate this month, would like position as assistant to Veterinarian either in New York or Brooklyn. Address,

X. Y. Z., care of SABISTON & MURRAY,
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Veterinary practice (established four years) in city of forty-five thousand (45,000) in farming country. Only one other graduate within one hundred and ten miles (110). Frequent calls to neighboring towns. Cool summers. Good climate. Will be sold cheap for cash. For price, reason for leaving, etc. apply,

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